

'Αγώνης S (60V)



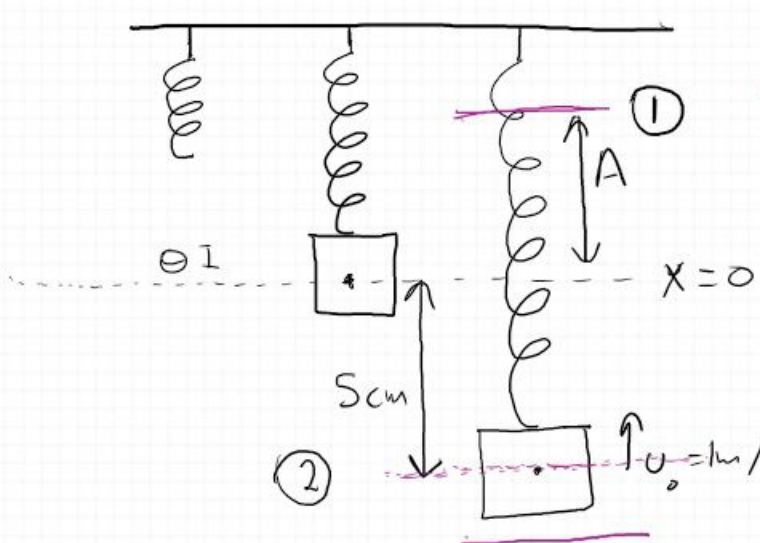
$m = 5 \text{ kg}$
 $\Rightarrow k = 2000 \text{ N/m}$
 $t = 0 \rightsquigarrow -5 \text{ cm}$
 $v_0 = 1 \text{ m/s}$

- 1) $f = j$
- 2) $A = j$
- 3) $\varphi_0 = j$
- 4) $M \in$

* εαλ άνωθεν
κάτωθεν κίνηση

$$\omega = \sqrt{\frac{k}{m}}$$

$$\omega = 2\pi f$$



Αρχικές Συνθήκες

$t = 0 \text{ sec}$
 $x = -5 \text{ cm} = -0,05 \text{ m}$
 $v_0 = 1 \text{ m/s}$
 $\varphi_0 = j$

$$T_2 = \frac{1}{\text{sec}}$$

$$2\pi f = \sqrt{\frac{k}{m}} \Rightarrow f = \frac{1}{2\pi} \sqrt{\frac{k}{m}} = \frac{1}{2\pi} \sqrt{\frac{2000 \text{ N/m}}{5 \text{ kg}}} = \frac{1}{2\pi} \sqrt{400 \frac{\text{kg} \cdot \text{m/s}^2}{\text{kg}}} \Rightarrow$$

$\rightarrow H_2$

$$\Rightarrow f = \frac{1}{2\pi} 20 \cdot \frac{1}{5} \rightsquigarrow \frac{10}{\pi} \text{ Hz}$$

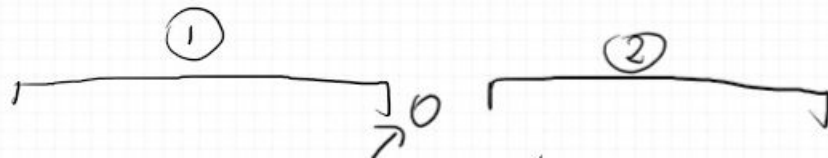
$N \rightarrow$

$$F = m \cdot a$$

$$N = \text{kg} \cdot \text{m/s}^2$$

①

②

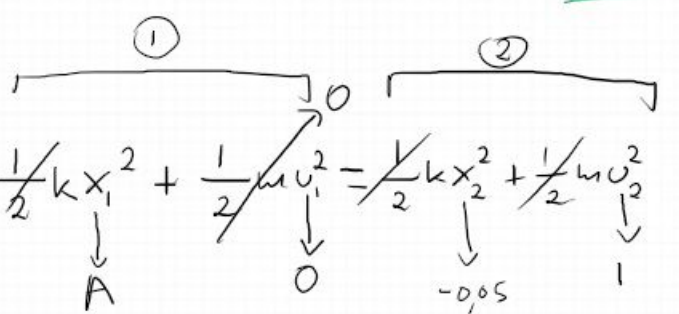


$$N = \text{kg} \cdot \text{m/s}^2$$

① ②

$$\textcircled{2} \quad M E_1 = M E_2 \Rightarrow V_1 + K_1 = V_2 + K_2 \Rightarrow \frac{1}{2} k x_1^2 + \frac{1}{2} m v_1^2 = \frac{1}{2} k x_2^2 + \frac{1}{2} m v_2^2 \Rightarrow A = \sqrt{\frac{k x_2^2 + m v_2^2}{k}} =$$

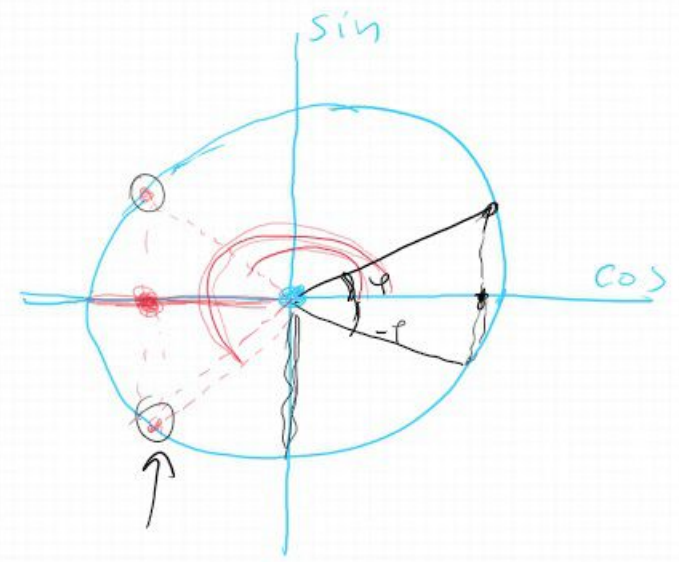
$$= \sqrt{\frac{2000(-0,05)^2 + 5(1)^2}{2000}} = 0,07 \text{ m} \approx 7 \text{ cm}$$



$$\textcircled{3} \quad y = A \cos(\omega t + \varphi) \Rightarrow \cos(\varphi) = \frac{y}{A} = \frac{-0,05}{0,07} \rightsquigarrow \varphi = \pm 2,366 \text{ rad}$$

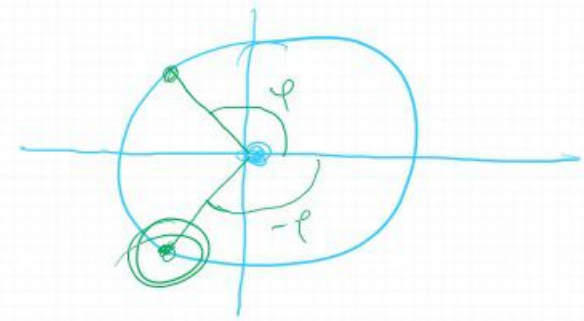
$$v = \frac{dy}{dt} \rightsquigarrow y'$$

$$\cos(-\varphi) = \cos(\varphi)$$



$$v = -\omega A \sin(\omega t + \varphi) \Rightarrow v = -\omega A \sin \varphi \Rightarrow 1 = -7\omega \sin \varphi \rightarrow \text{Aprocuras!}$$

Apa $\varphi = -2,366 \text{ rad}$



$$\textcircled{4} \quad M E = V_{\max} = \frac{1}{2} k A^2 = \frac{1}{2} 2000 (0,07)^2 = \dots \text{ J}$$

ΚΥΜΑΤΑ

Διαμήκη



Εγκάρσια



$$y(x, t) = f(x \pm vt)$$

?

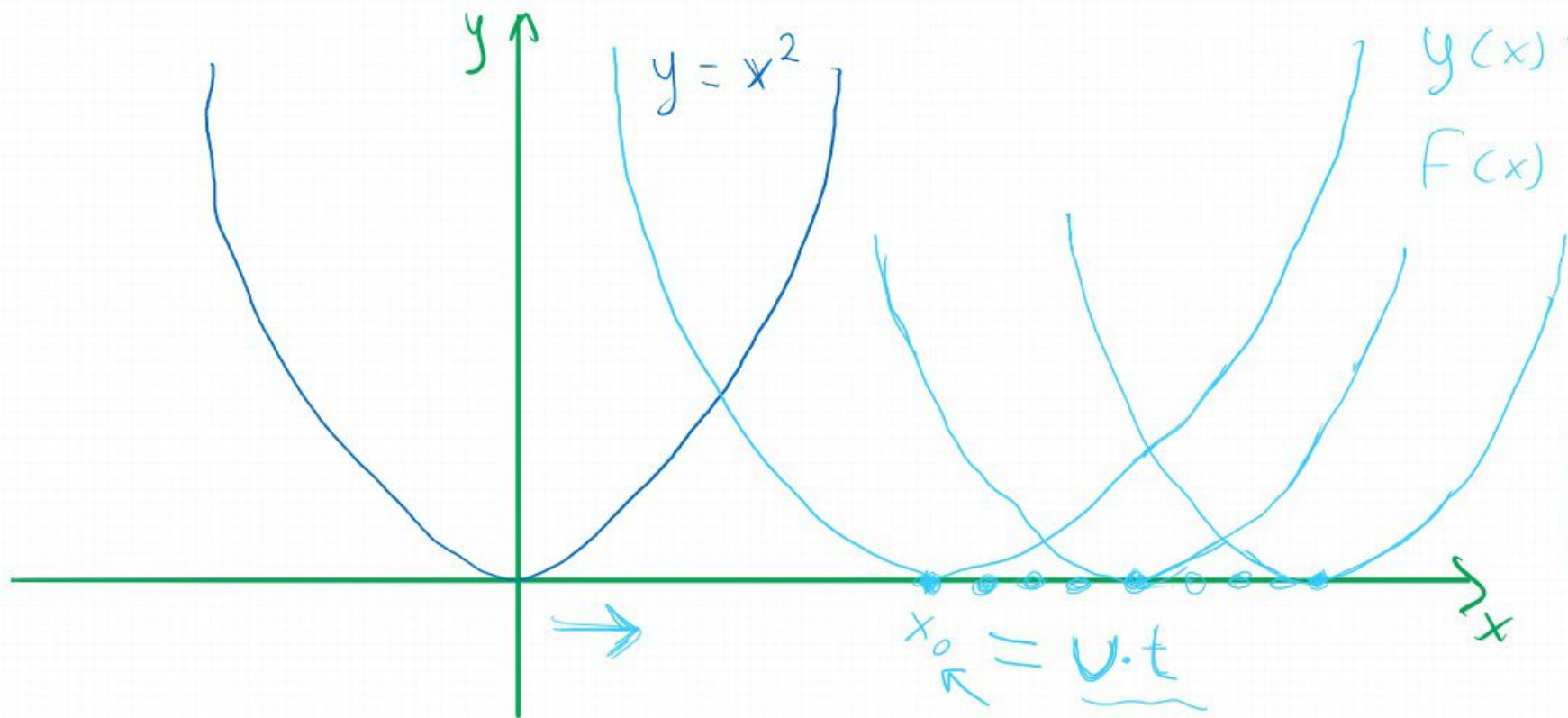
$$y = (x - x_0)^2$$

$$y(x) = (x - x_0)^2$$

$$F(x) = (x - x_0)^2$$

$$F(x, t) = (x - vt)^2$$

$$y(x, t) = f(x \pm vt)$$



'Ακνον I

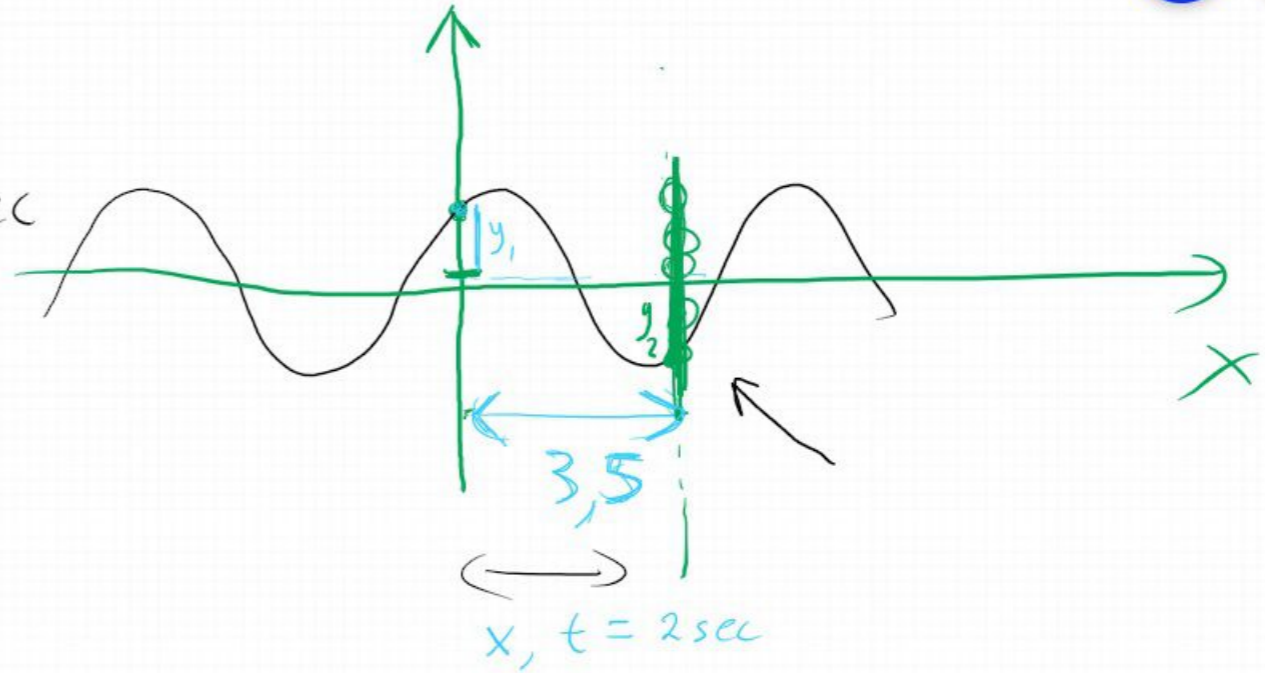
κύμα \rightarrow δέξια

$$v = 2 \text{ m/s}$$

$$t=0 \rightsquigarrow y = 20 \cdot e^{-0,5x^2}$$

$$y = ; \quad x = 3,5$$

$$t' = 2 \text{ sec}$$



$$y = 20 \cdot e^{-0,5x^2}$$

$$y(x, t) = 20 \cdot e^{-0,5(x-vt)^2}$$

$$y(3,5, 2) = 20 \cdot e^{-0,5(3,5 - 2 \cdot 2)^2} = 20 \cdot e^{-0,5(-0,5)^2} = 20 \cdot e^{-0,5^3} \Rightarrow$$

$$\Rightarrow y = 17,65 \text{ m}$$

Απλό Αρμονικό Κύμα

$$y(x, t) = A \cos k(x \pm vt) = A \cos(kx \pm \underbrace{kv}_{\omega} t)$$

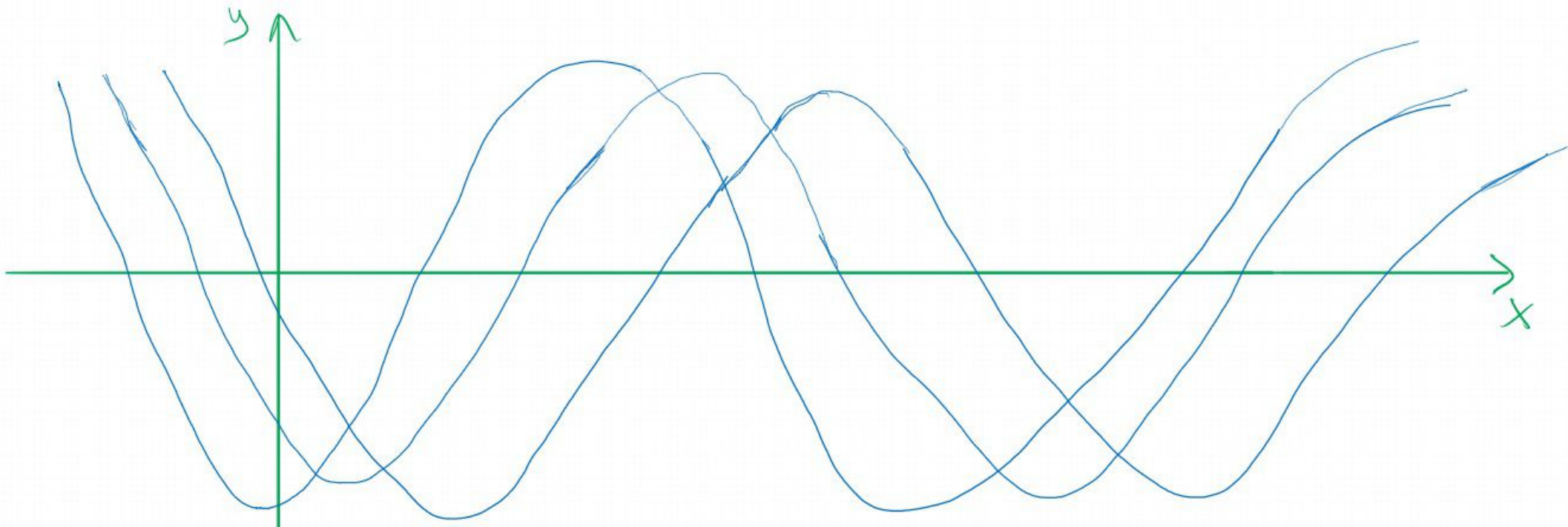
↑ κυμαριθμός

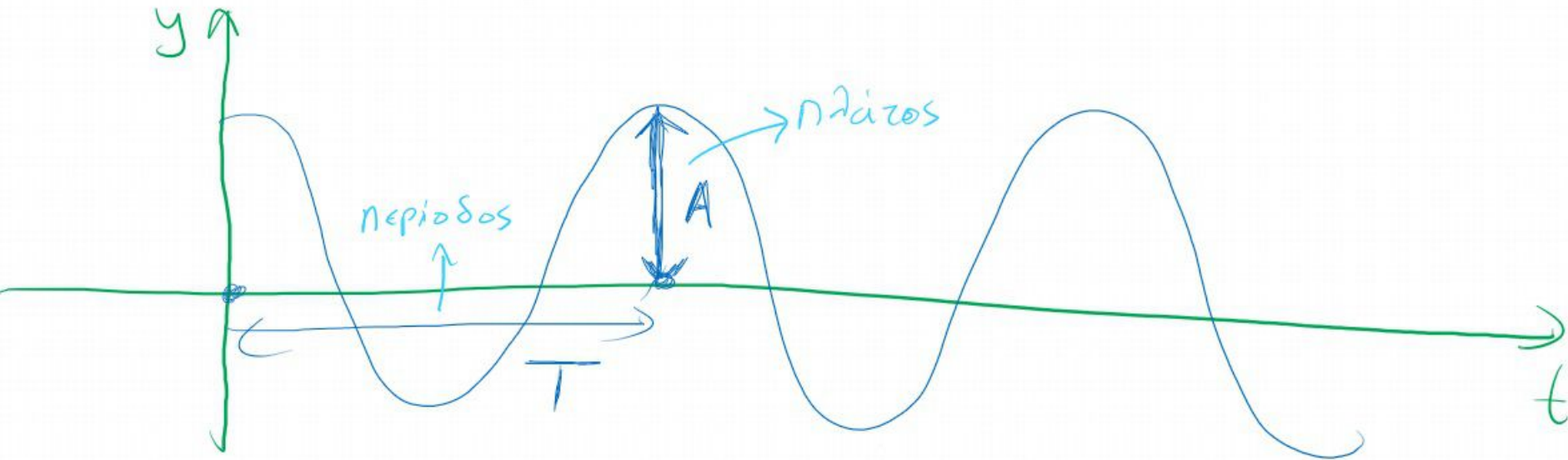
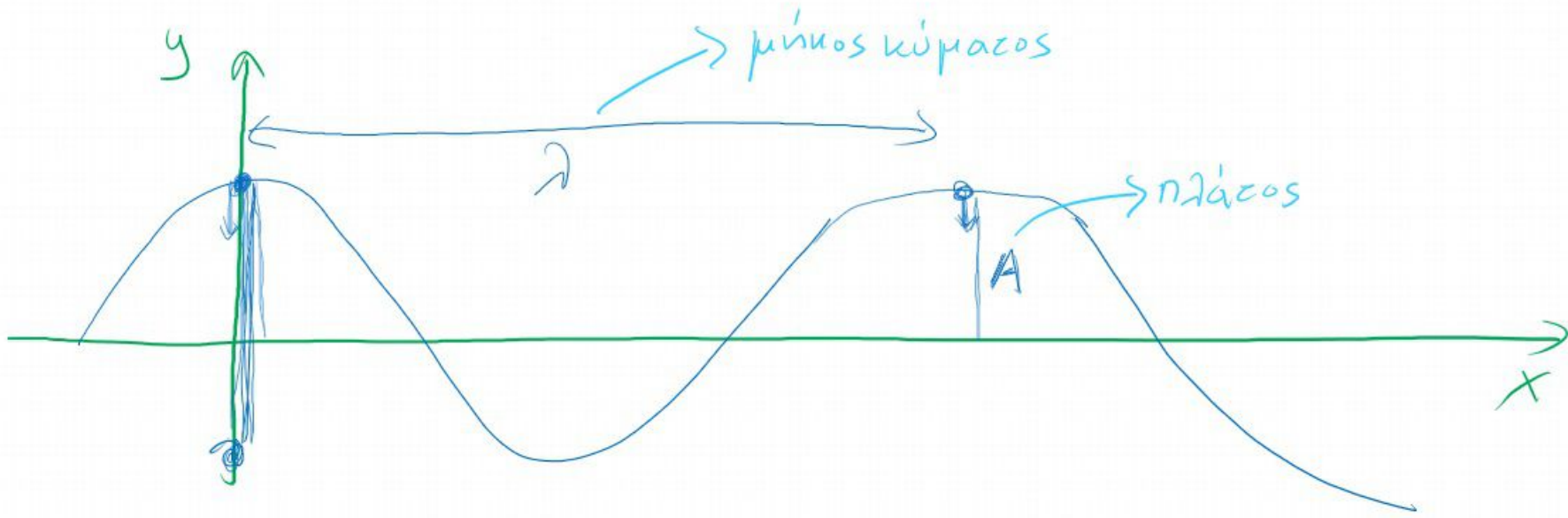
$$\omega = \frac{2\pi}{T} \text{ ή } 2\pi f$$

$$k = \frac{2\pi}{\lambda}$$

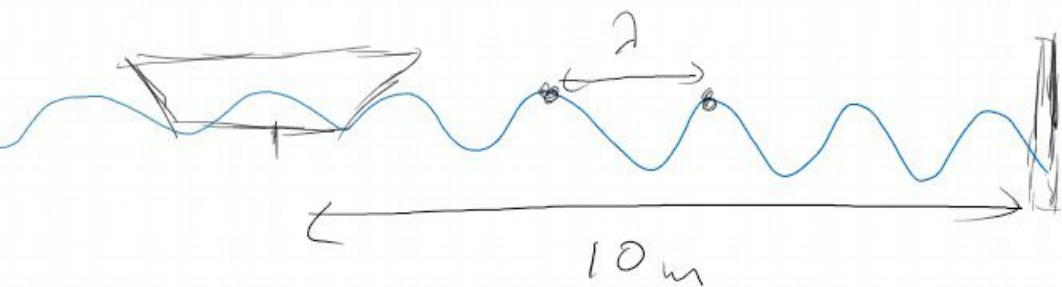
$$v = \lambda \cdot f$$

$y(x, t) = A \cos(kx \pm \omega t)$





'Ασκηση 2



1 min \rightarrow 40 κύματα

1 κύμα (σάρμα-πίεση) \sim 5 sec \leftarrow

$$\lambda = ;$$

$$f = \frac{n}{t} = \frac{40}{60} = \frac{2}{3} \text{ Hz}$$

$$v = \frac{x}{t} = \frac{10}{5} = 2 \text{ m/s}$$

$$v = \lambda \cdot f \Rightarrow \lambda = v/f$$

$$\lambda = \frac{2 \text{ m/s}}{2/3 \text{ 1/s}} = \underline{\underline{3 \text{ m}}}$$